<u>IN THE CLAIMS</u>:

Please find a listing of the claims below. The statuses of the claims are shown in parentheses.

1. (Canceled).

2. (Previously presented) A method for gamut mapping of an input image using a space varying algorithm, comprising:

receiving the input image;

converting the color representations of an image pixel set to produce a corresponding electrical values set;

applying the space varying algorithm to the electrical values set to produce a color-mapped value set;

reconverting the color-mapped value set to an output image; and

wherein the space varying algorithm minimizes the following variational problem:

$E(u) = \int_{\Omega}(D^2 + \alpha|\nabla D|^2)d\Omega$, subject to $u \in \vartheta$, wherein Ω is a support of the input image, ϑ is the target gamut, α is a non-negative real number, $D=g*(u-u_0)$, g is a normalized Gaussian kernel with zero mean and a small variance σ, u_0 is the input image, and u is the output image.

3. (Original) The method of claim 2, further comprising:

solving the variational problem at a high value of α;

solving the variational problem at a low value of α; and

averaging the solutions.

4. (Original) The method of claim 3, wherein the step of averaging the solutions comprises using a spatially adaptive weighting scheme, comprising:

$u_{final}[k,j] = w[k,j]u_{small}[k,j](1\text{-}w[k,j])u_{high}[k,j]$,

wherein the weight $w[k,j]$, comprises:

$$w[k,j] = \frac{1}{1 + \beta \left| \nabla g * u_0 \right|^2}, \text{ and}$$

wherein β is a non-negative real number.

5. (Original) The method of claim 2, wherein the variational problem is solved according to:

$$\frac{du}{dt} = \alpha g * \Delta D - g * D, \text{ subject to } u \in \vartheta.$$

6. (Original) The method claim 2, wherein the space varying algorithm is solved according to:

$$u_{ij}^{n+1} = u_{ij}^{n} + \tau(\alpha L_{ij}^{n} - \overline{D_{ij}^{n}}), \text{ subject to } u_{ij}^{n} \in \vartheta, \text{ wherein}$$

$$\tau = dt,$$

$$D^{n} = g * g * (u^{n} - u_0)$$

$L^n = D_2 * (u^n - u_0)$ and

$D_2 = g_x * g_x + g_y * g_y$

7. (Previously presented) A method for gamut mapping of an input image using a space varying algorithm, comprising:

receiving the input image;

converting the color representations of an image pixel set to produce a corresponding electrical values set;

applying the space varying algorithm to the electrical values set to produce a color-mapped value set;

reconverting the color-mapped value set to an output image; and

wherein the space varying algorithm minimizes the following variational problem:

$E(u) = \int_{\Omega} (\rho_1(D) + \alpha\rho_2(|\nabla D|))d\Omega$, subject to $u \in \vartheta$, wherein ρ_1 and ρ_2 are scalar functions, Ω is a support of the image, ϑ is the target gamut, α is a non-negative real number, $D=g*(u-u_0)$, g is a normalized Gaussian kernel with zero mean and a small variance σ, u_0 is the input image, and u is the output image.

8. (Original) The method of claim 2, further comprising:

decimating the input image to create one or more resolution layers, wherein the one or more resolution layers comprises an image pyramid; and

solving the variational problem for each of the one or more resolution layers.

9. (Previously presented) The method of claim 2, wherein the method is executed in at least one of a camera and a printer.

10. (Previously presented) The method of claim 7, wherein the method is executed in at least one of a camera and a printer.

Claims 11 and 12. (Canceled).

13. (Previously presented) A computer-readable memory for color gamut mapping, comprising an instruction set for executing color gamut mapping steps, the steps, comprising:

converting first colorimetric values of an original image to second colorimetric values, wherein output values are constrained within a gamut of the output device; using a space varying algorithm that solves an image difference problem; and

optimizing a solution to the image difference problem, wherein the image difference problem is represented by:

$$E(u) = \int_{\Omega} (D^2 + \alpha |\nabla D|^2) d\Omega$$

subject to $u \in \vartheta$, wherein Ω is a support of an input image, α is a non-negative real number, ϑ is the target gamut, $D=g*(u-u_0)$, g is a normalized Gaussian kernel with zero mean and small variance σ, u_0 is the input image, and u is an output image.

14. (Previously presented) The computer-readable memory of claim 13, wherein the instruction set further comprises steps for:

solving the image difference problem at a high value of α;

solving the image difference problem at a low value of α; and

averaging the solutions.

15. (Original) The computer-readable memory of claim 14, wherein averaging the solutions comprises using a spatially adaptive weighting scheme, comprising:

$u_{final}[k,j] = w[k,j]u_{small}[k,j](1\text{-}w[k,j])u_{high}[k,j]$,

wherein the weight $w[k,j]$, comprises:

$$w[k,j] = \frac{1}{1 + \beta |\nabla g * u_0|^2}, \text{ and}$$

wherein β is a non-negative real number.

16. (Previously presented) A computer-readable memory for color gamut mapping, comprising an instruction set for executing color gamut mapping steps, the steps, comprising:

converting first colorimetric values of an original image to second colorimetric values, wherein output values are constrained within a gamut of the output device; using a space varying algorithm that solves an image difference problem; and

optimizing a solution to the image difference problem, wherein the image difference problem is represented by:

$E(u) = \int_\Omega (\rho_1(D) + \alpha\rho_2(|\nabla D|))d\Omega$, wherein ρ_1 and ρ_2 are scalar functions.

17. (Currently amended) A computer-readable memory for color gamut mapping, comprising an instruction set for executing color gamut mapping steps, the steps, comprising:

converting first colorimetric values of an original image to second colorimetric values, wherein output values are constrained within a gamut of the output device; using a space varying algorithm that solves ~~an image difference problem~~ the following variational problem:

$E(u) = \int_{\Omega} (D^2 + \alpha |\nabla D|^2) d\Omega$, subject to $u \in \vartheta$, wherein Ω is a support of the input image, ϑ is the target gamut, α is a non-negative real number, $D=g*(u-u_0)$, g is a normalized Gaussian kernel with zero mean and a small variance σ, u_0 is the input image, and u is the output image; and

~~optimizing a solution to the image difference problem,~~ wherein the instruction set further comprises steps for:

decimating the input image to create one or more resolution layers, wherein the one or more resolution layers comprise an image pyramid; and

solving the ~~image difference~~ variational problem for each of the one or more resolution layers.

18. (Currently amended) The computer-readable memory of claim 17, wherein the instruction set further comprises steps for:

(a) initializing a first resolution layer;

(b) calculating a gradient G for the resolution layer, the gradient G comprising:

$G = \Delta(u - u_0) + \alpha_K(u - u_0)$, wherein Δx is a convolution of each color plane of x with

$K_{LAP} = \begin{bmatrix} 0 & 1 & 0 \\ 1 & -2 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ and $\alpha_k = \alpha_0 * 2^{2(k-1)}$, <u>wherein K_{LAP} is a Laplacian kernel, k is a kernel, and α_0 is an initial non-negative real number;</u>

(c) calculating a<u>n</u> ~~normalized steepest descent~~ <u>iteration layer</u> value $L_j = L_{j-1} - \mu_0 * \mu_{NSD} * G$, wherein μ_0 is a constant<u>, j is a specific resolution layer, and μ_{NSD} is a normalized steepest descent parameter</u>;

(d) projecting the value onto constraints $Proj_{\vartheta}(L_j)$, wherein $Proj_{\vartheta}(x)$ is a projection of x into a gamut ϑ; and

(e) for a subsequent resolution layer, <u>upscaling from one resolution layer to another and</u> repeating steps (b) – (d).

19. (Currently amended) A method for image enhancement using gamut mapping, comprising:

receiving a input image;

from the input image, constructing an image pyramid having a plurality of resolution layers;

processing each resolution layer, wherein the processing includes completing a gradient iteration, by:

calculating a gradient G, for $G = \Delta(u\text{-}u_0) + \alpha_k(u\text{-}u_0)$, wherein u is the iterated image, u_0 is the input image at the appropriate resolution layer, and α is a non-negative real number;

completing a gradient descent iteration; and

projecting the completed gradient descent iteration onto constraints; and

computing an output image using the processed resolution layers.

20. (Canceled).

21. (Currently amended) The method of claim 19, wherein completing the gradient descent iteration (L_j) comprises calculating:

$$\mu_{NSD} = {\Sigma G^2}/{(\Sigma(G * \Delta G) + \alpha_k \Sigma G^2)} \text{ ; and}$$

$$L_j = L_{j\text{-}1} - \mu_0 \cdot \mu_{NSD} \cdot G,$$

wherein μ_{NSD} is a normalized steepest descent parameter, μ_0 is a constant, k is a number of resolution layers in the image pyramid, and j is a specific resolution layer.

22. (Original) The method of claim 19, wherein projecting the completed gradient descent iteration onto the constraints is given by:

$L_j = Proj_a(L_j)$,

wherein $Proj_a(x)$ is a projection of x into a gamut ϑ.

23. (Currently amended) The method of claim 19, wherein constructing the image pyramid, comprises:

smoothing the input image with a Gaussian kernel;

decimating the input image; and

setting initial ~~conductive~~condition $L_0 = \max\{Sp\}$, wherein Sp is an image with the coarsest resolution layer for the image pyramid.

24. (Original) The method of claim 23, wherein the Gaussian kernel, comprises:

$$K_{PYR} = \begin{bmatrix} \frac{1}{16} & \frac{1}{8} & \frac{1}{16} \\ \frac{1}{8} & \frac{1}{4} & \frac{1}{8} \\ \frac{1}{16} & \frac{1}{8} & \frac{1}{16} \end{bmatrix}$$

25. (Previously presented) The method of claim 19, wherein processing each resolution layer further comprises applying a space varying algorithm to minimize the following variational problem:

$E(u) = \int_{\Omega} (D^2 + \alpha |\nabla D|^2) d\Omega$, subject to $u \in \vartheta$, wherein Ω is a support of the image, ϑ is the target gamut, and $D=g*(u-u_0)$, wherein g is a normalized Gaussian kernel with zero mean and small variance σ, u_0 is the input image, u is the output image, and wherein α is a non-negative real number.

26. (Original) The method of claim 19, wherein processing each resolution layer comprises applying a space varying algorithm to minimize a variational problem represented by:

$E(u) = \int_{\Omega} (\rho_1(D) + \alpha\rho_2(|\nabla D|))d\Omega$, subject to $u \in \vartheta$, wherein ρ_1 and ρ_2 are scalar function.

27. (Original) The method of claim 26, wherein ρ1 and ρ2 are chosen from the group comprising $\rho(x) = |x|$ and $\rho(x) = \sqrt{1 + x^2}$.